# Algebra 2
# Mathematics
# Item Specifications

Missouri
DEPARTMENT OF ELEMENTARY & SECONDARY
EDUCATION

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# Introduction

In 2014 Missouri legislators passed House Bill 1490, mandating the development of the Missouri Learning Expectations. In April of 2016, these Missouri Learning Expectations were adopted by the State Board of Education. Groups of Missouri educators from across the state collaborated to create the documents necessary to support the implementation of these expectations.

One of the documents developed is the item specification document, which includes all Missouri grade level/course expectations arranged by domains/strands. It defines what could be measured on a variety of assessments. The document serves as the foundation of the assessment development process.

Although teachers may use this document to provide clarity to the expectations, these specifications are intended for summative, benchmark, and large-scale assessment purposes.

Components of the item specifications include:

**Expectation Unwrapped** breaks down a list of clearly delineated content and skills the students are expected to know and be able to do upon mastery of the Expectation.

**Depth of Knowledge (DOK) Ceiling** indicates the highest level of cognitive complexity that would typically be assessed on a large scale assessment. The DOK ceiling is not intended to limit the complexity one might reach in classroom instruction.

**Item Format** indicates the types of items used in large scale assessment. For each expectation, the item format specifies the type best suited for that particular expectation.

**Text Types** suggests a broad list of text types for both literary and informational expectations. This list is not intended to be all inclusive: other text types may be used in the classroom setting. The expectations were written in grade level bands; for this reason, the progression of the expectations relies upon increasing levels of quantitative and qualitative text complexities.

**Content Limits/Assessment Boundaries** are parameters that item writers should consider when developing a large scale

assessment. For example, some expectations should not be assessed on a large scale assessment but are better suited for local assessment.

**Sample stems** are examples that address the specific elements of each expectation and address varying DOK levels. The sample stems provided in this document are in no way intended to limit the depth and breadth of possible item stems. The expectation should be assessed in a variety of ways.

# High School Algebra 2

## Frequently asked questions for Item Specification and Sample Stems

**1. What is the purpose of the Item Specification document?**
Historically, Item Specification documents are written for test item writers. In Missouri, this document was seen as a resource for not only item writers, but teachers as well. The unwrapped section should provide more detail on the meaning of the standard and the sample stems should provide example items that also help clarify the standard. In this update, the language used in the Expanded Expectations document was included to merge the two documents for easier access. In some standards a "Notes" section was added to provide additional information.

**2. Why do some unwrapped sections have the same few sentences at the beginning?**
For standards that have multiple parts and are listed as sub expectations, e.g., NF.C.5.b, the first part highlights the intent of that standard series. Often, these standards should be taught together as they develop a bigger idea or concept.

**3. Why is the Fluency definition only on some standards?**
Certainly, students having experience using different strategies and picking the strategy they feel best for given situations is important to improving student knowledge in mathematics. The Missouri Educators working on the document felt it important to highlight areas where student access to multiple strategies would provide the greatest support. Listing fluency in all standards would likely lessen the impact needed.

**4. What does the "e.g." mean when listed in the unwrapped section?**
The "e.g." is a way to highlight a list of examples, ideas, or concepts. It is **not** an exhaustive list, nor is it intended to represent the best examples. It is merely a partial list to provide some examples.

**5. What does "with or without context" mean?**
This phrase was used to highlight that the math problems might have some situational context or could possibly be a strictly number or symbol situation. The Educators working on this update wanted the focus to be on using math to solve problem situations rather than a focus on "real world" problems.

**6. Are the Sample Stems examples of summative test items?**
The Sample Stems could be a classroom item or possibly an assessment item. In some cases, the problem used would have to be adjusted to use on a Statewide assessment. The goal was to give students and teachers a problem that aligns to the standard. The Stems provided in the document are an example. The educators assisting with the update in some cases created more than one example and those are listed at the bottom of the document. All examples are good, some fit better on the page within the Item Specification which have determined those shown in both places.

**7. Why are there no answers listed with the Sample Stems?**
The focus of the Sample Stems should be on the work students can demonstrate to indicate their level of understanding for the given standard. While the answer is one component, when given, it frequently becomes the focus which does not provide important information in the learning process.

**8. What does "No Limits" mean in the Limits and Boundaries section?**
Where there are no limits or boundaries to be listed, "No Limits" was used to indicate this situation and help those using the document understand that it wasn't an oversight. IMPORTANT NOTE: if the standard itself or the cluster heading lists a specific limit, e.g., specific denominators, size or type of number, that was not duplicated in the Limits section.

**9. Why do some words show a short definition?**
While this does not serve as a replacement for a glossary, there were terms within the unwrapping that the committee felt should have meaning included. This occurs in the standard where it specifically addresses the concept in the standard, e.g., cardinality, trapezoid.

**10. Why are Kindergarten and Grade 1 Sample Stems a bit different?**
Students in Kindergarten and Grade 1 are beginning readers, so teachers should expect to read problems to the students rather than only providing problems to be solved.

| Mathematics | | A2.NQ.A.1 |
|---|---|---|
| **NQ A 1** | **Number and Quantity**<br>**Extend and use the relationship between rational exponents and radicals.**<br>Extend the system of powers and roots to include rational exponents. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will extend the system of powers and roots to include rational exponents.

**Sample Stems**

Use the table below to look for patterns. Describe how those patterns help show the extension of the system of powers to include rational numbers.

| | | | |
|---|---|---|---|
| $\frac{1}{4}$ | $\mathbf{2}^{?}$ | $\mathbf{4}^{?}$ | $\mathbf{8}^{?}$ |
| $\frac{1}{2}$ | $\mathbf{2}^{?}$ | $\mathbf{4}^{?}$ | $\mathbf{8}^{?}$ |
| **1** | $\mathbf{2^0}$ | $\mathbf{4^0}$ | $\mathbf{8^0}$ |
| **2** | $\mathbf{2^1}$ | $\mathbf{4}^{?}$ | $\mathbf{8}^{?}$ |
| **4** | $\mathbf{2^2}$ | $\mathbf{4^1}$ | $\mathbf{8}^{?}$ |
| 8 | $2^3$ | $\mathbf{4}^{?}$ | $\mathbf{8^1}$ |
| 16 | $2^4$ | $\mathbf{4^2}$ | $\mathbf{8}^{?}$ |
| 32 | $\mathbf{2}^{?}$ | $\mathbf{4}^{?}$ | $\mathbf{8}^{?}$ |
| 64 | $\mathbf{2}^{?}$ | $\mathbf{4}^{?}$ | $\mathbf{8}^{?}$ |
| 128 | $\mathbf{2}^{?}$ | $\mathbf{4}^{?}$ | $\mathbf{8}^{?}$ |

Be sure to indicate the values for each question mark exponent in the table.

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.NQ.A.2 |
|---|---|---|
| **NQ A 2** | **Number and Quantity**<br>**Extend and use the relationship between rational exponents and radicals.**<br>Create and recognize equivalent expressions involving radical and exponential forms of expressions. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will create and recognize equivalent expressions involving radical and exponential forms of expressions containing exponents, including rational exponents.

**Sample Stems**

Create equivalent expressions using other radical and exponential forms for each of the expressions below.

$\frac{81^{\frac{2}{3}}}{3}$ $\left(\frac{729}{64}\right)^{\frac{5}{6}}$ $\sqrt[3]{27x^5y^8}$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.NQ.A.3 |
|---|---|---|
| **NQ A 3** | **Number and Quantity**<br>**Extend and use the relationship between rational exponents and radicals.**<br>Add, subtract, multiply and divide radical expressions. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will add, subtract, multiply and divide radical expressions. | | **Sample Stems**<br><br>Divide the following expression.<br>$x \div (x - \sqrt{2})$<br>Describe what it means to rationalize the denominator.<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>No Limits. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 2 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

| Mathematics | | A2.NQ.A.4 |
|---|---|---|
| **NQ A 4** | **Number and Quantity**<br>**Extend and use the relationship between rational exponents and radicals.**<br>Solve equations involving rational exponents and/or radicals and identify situations where extraneous solutions may result. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will solve equations involving rational exponents and/or radicals and manage appropriately the situations where extraneous solutions may result.

**Sample Stems**

Find all the solutions where y equals 0 for the following equation.

$$y = \frac{x^3 + 5x^2 + 3x - 9}{x + 3}$$

Given the solutions, describe how each solution relates to the equation.

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.NQ.B.5 |
|---|---|---|
| **NQ B 5** | **Number and Quantity**<br>**Use complex numbers.**<br>Represent complex numbers. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will represent complex numbers in the form $a + bi$, where $a$ and $b$ are real numbers. The symbol $\boldsymbol{i}$ is defined to be the square root of -1. The student should understand that $\frac{2+2i}{4}$ is equivalent to $\frac{1}{2} + \frac{1}{2}i$. | | **Sample Stems**<br><br>Given the following complex number, $7 + 3i$, describe what each part of the number represents.<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>No Limits. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 2 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

| Mathematics | | A2.NQ.B.6 |
|---|---|---|
| **NQ**<br>**B**<br>**6** | **Number and Quantity**<br>**Use complex numbers.**<br>Add, subtract, multiply and divide complex numbers. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will add, subtract, multiply, and divide complex numbers. The student should understand that $\frac{2+2i}{4}$ is equivalent to $\frac{1}{2}+\frac{1}{2}i$.

**Sample Stems**

Perform the indicated operations for the following problems involving complex numbers.

$(2+3i)+(4-3i)$

$(2+3i)-(4-3i)$

$(2+3i)\times(4-3i)$

$(2+3i)\div(4-3i)$

Use the work to support comments you would share with a classmate, if they missed the day complex numbers were discussed. What things should you pay attention to and watch out for as you solve these problems?

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.NQ.B.7 |
|---|---|---|
| **NQ B 7** | **Number and Quantity**<br>**Use complex numbers.**<br>Know and apply the Fundamental Theorem of Algebra. | **PRIORITY STANDARD** |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will know and apply the Fundamental Theorem of Algebra for all polynomials factorable over the real numbers. The Fundamental Theorem of Algebra says that any polynomial equation of degree $n$ with complex number coefficients has $n$ roots, or solutions, in the complex numbers, e.g., complex roots must be in pairs.

**Sample Stems**

Theo and Al were studying the Fundamental Theorem of Algebra and were finding some questions. They were looking at two equations. One of them matched their understanding of the Theorem, but one did not. Identify which equation might have given them some reason to question the Theorem and explain what they may have done in error.

$$y = x^3 + 6x^2 + 11x + 6$$

$$y = x^3 + 5x^2 + 8x + 4$$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.SSE.A.1 |
|---|---|---|
| **SSE**<br>**A**<br>**1** | **Seeing Structure in Expressions**<br>**Define and use logarithms**<br>Develop the definition of logarithms based on properties of exponents. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will develop an understanding and ability to use the definition of logarithms to translate between logarithmic and exponential expressions. This would include $\log_b(z) = t$ if and only if $b^t = z$.

**Mathematical Fluency** is more than a quick answer on some timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain connections between logarithmic and exponential expressions to translate between logarithmic and exponential expressions.

**Sample Stems**

Use the properties of exponents to explain why the following logarithm property must be true.

$$\log ab = \log a + \log b$$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.SSE.A.2 |
|---|---|---|
| **SSE A 2** | **Seeing Structure in Expressions**<br>**Define and use logarithms**<br>Use the inverse relationship between exponents and logarithms to solve exponential and logarithmic equations. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will use the inverse relationship between exponents and logarithms to solve exponential and logarithmic equations.<br><br>**Mathematical Fluency** is more than a quick answer on some timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.<br><br>The student will use and explain connections between logarithmic and exponential expressions to solve problems with or without context involving exponential and logarithmic equations. | | **Sample Stems**<br><br>In class, Tommi has been studying how exponential and logarithmic equations are inverses. She finds the inverse of $y = 2^x$, but wants some suggestions on how to demonstrate that it is in fact the inverse. Find the inverse of Tommi's problem and show how to verify that the two equations are inverses. Your explanation should include graphs, coordinate values, or other mathematical strategies.<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>No Limits. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 2 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

| Mathematics | | A2.SSE.A.3 |
|---|---|---|
| **SSE A 3** | **Seeing Structure in Expressions**<br>**Define and use logarithms**<br>Use properties of logarithms to solve equations or find equivalent expressions. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will use properties of logarithms to create equivalent expressions or equations to solve problems. Using properties of logarithms means students have the fluency to find equivalent forms, i.e., convert exponents into a multiplier (factor); convert between a logarithm of factors and sums of the logarithms factors; and convert between a logarithm of a quotient and the difference of the logarithms of the dividend and divisor.

**Mathematical Fluency** is more than a quick answer on some timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context involving properties of logarithms to solve equations or find equivalent expressions.

**Sample Stems**

How can the following expression be written as a sum or difference of logs?

$$\log_5 3a^2\left(\frac{1}{2}\right)b^5$$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.SSE.A.4 |
|---|---|---|
| **SSE**<br>**A**<br>**4** | **Seeing Structure in Expressions**<br>**Define and use logarithms**<br>Understand why logarithmic scales are used, and use them to solve problems. | **PRIORITY STANDARD** |

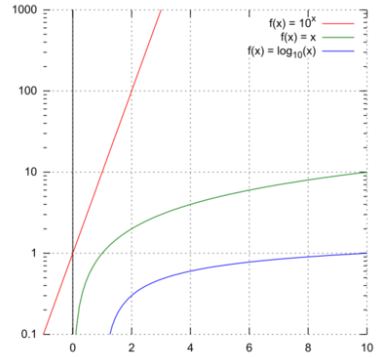
**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will understand why logarithmic scales are used and use them to solve problems. Logarithmic scales provide a way to represent data when some of the data is much greater or much less than the other data being displayed. Logarithmic scales do not increase in equal increments, each interval is increased by a factor of the base of the logarithm. Typically, a common log (base 10) or a natural log (base *e*) are used.

The student will use logarithmic scales to compare quantities and solve problems involving logarithms, e.g., pH scale, earthquake intensity, light intensity, and sound intensity.

**Sample Stems**

The following graph shows a logarithmic scale. Describe each of the 3 functions represented. Be sure to include characteristics including the impact on the y values as x increases, the type of function represented, any domain and range observations, or other mathematical concepts observed.




Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 3

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

# High School Algebra 2

| Mathematics | | A2.REI.A.1 |
|---|---|---|
| REI<br>A<br>1 | **Reasoning with Equations and Inequalities**<br>**Solve equations and inequalities.**<br>Create and solve equations and inequalities, including those that involve absolute value. | **PRIORITY STANDARD** |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will create and solve equations and inequalities with or without context, including those that involve absolute value. These equations and inequalities would include, but would not be limited to: linear, quadratic, cubic, exponential, absolute value, piecewise, and step functions. The student may use graphical and/or algebraic methods to solve these problems.

**Mathematical Fluency** is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context to create and solve equations and inequalities.

**Sample Stems**

Two Algebra 2 classmates are arguing about the solution to a problem. Stephanie and Matthew both worked on the problem and felt their solution was correct. The problem asked students to find an equation for the sequence listed below. Compare each student's equation and discuss whether it fits the sequence listed. Remember that you can support your conclusions using words, tables, or graphs.

The sequence: $\frac{2}{9}, \frac{4}{27}, \frac{8}{81}, \frac{16}{243}, \ldots$

Stephanie's solution: $t_n = \frac{2}{9} \times \left(\frac{2}{3}\right)^{(n-1)}$

Matthew's solution: $n_x = \frac{2^x}{3^{(x+1)}}$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

Limit inequalities to linear, quadratic, and absolute value functions.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.REI.A.2 |
|---|---|---|
| **REI A 2** | **Reasoning with Equations and Inequalities**<br>**Solve equations and inequalities.**<br>Solve rational equations where numerators and denominators are polynomials and where extraneous solutions may result. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will solve rational equations, where numerators and denominators can be expressed as polynomials and where extraneous solutions may result.<br><br>The student will justify why a solution is extraneous. | | **Sample Stems**<br><br>Solve the following rational equation. Be sure to support your solution using words, graphs, or other mathematical strategies.<br><br>$\frac{x}{x+2} - 4 = \frac{-2}{x-2}$<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>No Limits. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 2 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

| Mathematics | | A2.REI.B.3 |
|---|---|---|
| REI<br>B<br>3 | **Reasoning with Equations and Inequalities**<br>**Solve general systems of equations and inequalities.**<br>Create and solve systems of equations that may include non-linear equations and inequalities. | **PRIORITY STANDARD** |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will create and solve systems of equations or inequalities, with or without context. Extend solving systems of equations to finding solutions of systems with two unknowns that include non-linear equations or inequalities. The student may use graphical and/or algebraic methods.

For Algebra 2, systems with both equations and inequalities could be considered a mixed system.

Note:
Students should experience systems, including circles where the equations should be given in standard form, e.g., $(x-h)^2+(y-k)^2=r^2$.

**Sample Stems**

Thom believes that system of equations having a quadratic and linear equation will have zero, one or two solutions. Using the system of equations below, find a value of *k* so there will be zero solutions, find a value of *k* so there will be one solution, and find a value of *k* so there will be two solutions.

$$y = x^2 - 2x - 8$$
$$y = kx - 6$$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

Limit systems of equations to have three or fewer unknowns.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 3

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.APR.A.1 |
|---|---|---|
| **APR**<br>**A**<br>**1** | **Arithmetic with Polynomials and Rational Expressions**<br>**Perform operations on polynomials and rational expressions**<br>Extend the knowledge of factoring to include factors with complex coefficients. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will develop and extend knowledge of factoring polynomials and rational expressions in order to find factors that include complex coefficients and complex numbers.

Note:
This expectation develops student understanding of factoring to find key characteristics such as zeros (roots), common factors, discontinuities, and asymptotes.

**Sample Stems**

Find and compare the three factors for each of the functions below.

$$f(x) = x^3 - 2x^2 - 4x + 8$$
$$g(x) = x^3 - 2x^2 - 4x + 10$$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.APR.A.2 |
|---|---|---|
| **APR A 2** | **Arithmetic with Polynomials and Rational Expressions**<br>**Perform operations on polynomials and rational expressions**<br>Understand the Remainder Theorem and use it to solve problems. | **PRIORITY STANDARD** |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will use factoring techniques to solve general polynomial equations, which could include complex solutions.

The student will extend operations on polynomial expressions to include division of a polynomial of degree 2 or higher by a binomial. When appropriate the student will express the result as a quotient with a remainder.

The Remainder Theorem states that $p(a) = b$, where $b$ is the remainder after division of $p(x)$ by $(x - a)$; therefore, $(a, b)$ is a point on the graph of the function.

The Remainder Theorem can be combined with the Factor Theorem to assist in solving polynomials problems, e.g., if $b = 0$, then $(x - a)$ is a factor of $p(x)$, and $(a, 0)$ is a zero/root/x-intercept of the function with a solution of $x = a$.

**Sample Stems**

Use the Remainder Theorem to compare the values of $f(4)$ and $f(5)$ from the function below. Be sure to explain both the similarities and differences.

$f(x) = x^3 + 3x^2 - 16x - 48$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.APR.A.3 |
|---|---|---|
| **APR A 3** | **Arithmetic with Polynomials and Rational Expressions**<br>**Perform operations on polynomials and rational expressions**<br>Find the least common multiple of two or more polynomials. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will find the least common multiple of two or more polynomials. | | **Sample Stems**<br><br>Find the least common multiple for the following polynomials.<br>$2x^2 + 16x + 30$<br>$x^2 - 2x - 15$<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>Limit non-factored polynomials to degree four or less. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 1 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

| Mathematics | | A2.APR.A.4 |
|---|---|---|
| **APR A 4** | **Arithmetic with Polynomials and Rational Expressions**<br>**Perform operations on polynomials and rational expressions**<br>Add, subtract, multiply and divide rational expressions. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will add, subtract, multiply, and divide rational expressions.

**Mathematical Fluency** is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context to add, subtract, multiply, and divide rational expressions.

**Sample Stems**

Which operation, + - x or ÷, would create the largest solution for the following expression. Explain your answer using mathematical work and reasoning.

$$\frac{x^2-2x-15}{7x+21} \bigcirc \frac{x^2-3x-70}{x^2-49}$$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

Limit non-factorable polynomials to degree four or less.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.APR.A.5 |
|---|---|---|
| **APR A 5** | **Arithmetic with Polynomials and Rational Expressions**<br>**Perform operations on polynomials and rational expressions**<br>Identify zeros of polynomials when suitable factorizations are available, and use the zeros to sketch the function defined by the polynomial. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will identify zeros of polynomials when suitable factorizations are available.<br><br>The student will use the multiplicity of the zeros to sketch the function defined by the polynomial. The graph of a polynomial will cross the horizontal axis at a zero with odd multiplicity. The graph of a polynomial will touch the horizontal axis at a zero with even multiplicity. | | **Sample Stems**<br><br>Compare the following functions by identifying each function's zeros and then sketch each function. Describe observations about how the zeros are helpful in sketching functions, including situations to be aware of as the sketch is made.<br>$f(x) = x^4 + 2x^2 - 3$<br>$g(x) = x^3 - 2x^2 - 4x + 10$<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>Limit non-factorable polynomials to degree four or less. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 3 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

# High School Algebra 2

| Mathematics | | A2.IF.A.1 |
|---|---|---|
| **IF**<br>**A**<br>**1** | **Interpreting Functions**<br>**Use and interpret functions**<br>Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems. | **PRIORITY STANDARD** |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will solve problems with or without context by identifying the domain, range, and identifying unique characteristics of functions, i.e., x- and y-intercepts; end behavior; local (relative) maxima or minima values; symmetries; specific values of the function; intervals where the function is increasing, decreasing or constant; points of discontinuity; and asymptotes.

For Algebra 2, the focus is on vertical and horizontal asymptotes, but students should realize other asymptotes exist. The student should also realize that a graph can cross an asymptote. Students should be familiar with the following notations for domain and range: verbal descriptions, inequality, interval and set notation.

The student will be able to fluently translate between different representations (graphs, tables, and/or equations) of the function. For this expectation, function types include general polynomials, square roots, cube roots, absolute value, piecewise-defined, step, exponential, logarithmic, and rational functions.

**Mathematical Fluency** is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context to create and solve equations and inequalities.

**Sample Stems**

Identify and interpret the key characteristics of the function listed below. Be sure to include the following characteristics if they are applicable: domain, range, x- and y-intercepts; end behavior; local (relative) maxima or minima values; symmetries; specific values of the function; intervals where the function is increasing, decreasing or constant; points of discontinuity; and asymptotes. Also include how you used the graphing calculator or other graphing tool to support your answers.

$$k(x) = x^4 - x^3 - 6x^2 + 4x + 8$$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

Limit non-factorable polynomials to degree four or less.
Limit rational functions to those without oblique asymptotes.
Limit absolute value functions to linear.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 3

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.IF.A.2 |
|---|---|---|
| **IF**<br>**A**<br>**2** | **Interpreting Functions**<br>**Use and interpret functions**<br>Translate between equivalent forms of functions. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will fluently translate between equivalent forms of functions, e.g., write a quadratic function in vertex form, standard form, and/or intercept form.

The student will find equivalent forms of functions to highlight key characteristics, i.e., x- and y-intercepts; end behavior; local (relative) maxima or minima values; symmetries; specific values of the function; intervals where the function is increasing, decreasing or constant; points of discontinuity; and asymptotes.

**Mathematical Fluency** is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context to translate between equivalent forms of functions.

**Sample Stems**

Given the function listed below, describe the equivalent form (vertex, standard, or intercept) that would best help one determine some of the key characteristics, e.g., x- and y-intercepts; end behavior; local (relative) maxima or minima values; symmetries; intervals where the function is increasing, decreasing or constant.

$$f(x) = x^2 - 4x - 5$$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

Limit non-factorable polynomials to degree four or less.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.BF.A.1 |
|---|---|---|
| **BF**<br>**A**<br>**1** | **Building Functions** **PRIORITY STANDARD**<br>**Create new functions from existing functions.**<br>Create new functions by applying the four arithmetic operations and composition of functions (modifying the domain and range as necessary). | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will create functions by performing operations on functions, including addition, subtraction, multiplication, division, and composition of functions, including identifying the domain and range of the new function.

Students should be familiar with the following notations for composition of functions, e.g., $f(g(x))$ and $f \circ g(x)$, and for domain and range: verbal descriptions, inequality, interval, and set notation.

**Sample Stems**

Create two new functions by first adding *f*(x) to *g*(x) then subtracting *f*(x) from *g*(x). Compare the new domain and range to the original functions for each new function.

$$f(x) = x^2 + 4x - 21$$
$$g(x) = 2x^2 - x - 15$$

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

Limit compositions to two functions.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.BF.A.2 |
|---|---|---|
| **BF**<br>**A**<br>**2** | **Building Functions**<br>**Create new functions from existing functions.**<br>Derive inverses of functions, and compose the inverse with the original function to show that the functions are inverses. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will derive inverses of functions, e.g., algebraically or graphically.<br><br>The student will show that two functions are inverses by composing the inverse with the original function and vice versa: $f(g(x)) = x$ for all the $x$ in the domain of $g(x)$ and $g(f(x)) = x$ for all the $x$ in the domain of $f(x)$.<br><br>Note:<br>Students should know that one notation for an inverse of a function is $f^{-1}$. | | **Sample Stems**<br><br>Derive the inverse of the function shown below. Use algebraic or graphic support to verify the inverse of the function.<br><br>$g(x) = 2\log_4(x-5)$<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>Limit functions to linear, quadratic, cubic, square root, exponential, and logarithmic. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 2 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

| Mathematics | | A2.BF.A.3 |
|---|---|---|
| **BF**<br>**A**<br>**3** | **Building Functions** **PRIORITY STANDARD**<br>**Create new functions from existing functions.**<br>Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for linear, quadratic, cubic, square and cube root, absolute value, exponential and logarithmic functions. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections, and dilations, e.g., scale changes causing expansions or compressions horizontally or vertically.

For this expectation functions include linear, quadratic, cubic, square and cube root, absolute value, exponential, and logarithmic.

Note:
The focus of this cluster is for students to create new functions to model situations. The described effects of transformations are a component of generating functions.

**Mathematical Fluency** is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain effects of transformations to solve problems with or without context.

**Sample Stems**

Algebraically and geometrically describe the effect of doubling the length of a box (rectangular prism). Be sure to also include the impact on the volume and surface area of the box.

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 3

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.FM.A.1 |
|---|---|---|
| FM<br>A<br>1 | **Modeling**<br>**Use functions to model real-world problems**<br>Create functions and use them to solve applications of quadratic and exponential function model problems. | **PRIORITY STANDARD** |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will create functions and use them to solve applications of quadratic and exponential function models by fluently using tables, graphs, algebraic equations, or other mathematically valid methods. Possible problem situations include price, demand, cost, revenue, and profit situations; compound interest problems; and exponential growth or decay problems.

**Mathematical Fluency** is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context to create functions and use them to solve applications of quadratic and exponential function model problems.

**Sample Stems**

Create a function that would maximize the surface area of two of the faces of a box. The volume of box should be approximately 216 cubic inches and the width of the base should be at least 2 inches. Show how the function helps determine the maximum surface area for the two faces.

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 3

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.DS.A.1 |
|---|---|---|
| **DS**<br>**A**<br>**1** | **Data and Statistical Analysis**<br>**Make inferences and justify conclusions.**<br>Analyze how random sampling could be used to make inferences about population parameters. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will analyze and explain how random sampling could be used to make inferences about a population.<br><br>For this expectation, analyzing involves critically reviewing sampling to determine quality of randomness as well as considering the characteristics of the population (parameters). | | **Sample Stems**<br><br>Austin is conducting a study to determine which school sport the students at his high school are most likely to attend.<br><br>Austin plans to conduct his survey at an upcoming baseball game by polling students as they wait in line to buy tickets to the game. Would this survey be representative of the population as a whole? Why or why not?<br><br>How could Austin adjust his survey to better represent the population he is interested in?<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>No Limits. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 3 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

# High School Algebra 2

| Mathematics | | A2.DS.A.2 |
|---|---|---|
| **DS A 2** | **Data and Statistical Analysis**<br>**Make inferences and justify conclusions.**<br>Determine whether a specified model is consistent with a given data set. | **PRIORITY STANDARD** |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will determine whether a specified model is consistent with a given data set.

For Algebra 2, specified models could include probability, simulation, and algebraic function models to describe a given set of data. The data set may be represented as a graph, list, or table, e.g., using a function to determine if it was consistent to a given set of graphical data.

**Sample Stems**

Your math class is using the following algebraic function to model rolling a fair six-sided die, with numbers 1 to 6. The model could be used to predict the number of times the die will land on an even number.
$r(x) = .5x$, where x is the number of rolls made in the experiment and r(x) would be the number of times the die lands on an even number.
The class rolls the die 20 times and gets the following result: 4, 2, 3, 3, 6, 6, 2, 3, 5, 2, 4, 5, 2, 3, 3, 6, 1, 4, 6, 2
Explain whether or not this model is consistent with the given data set.

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 2

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.DS.A.3 |
|---|---|---|
| DS<br>A<br>3 | **Data and Statistical Analysis**<br>**Make inferences and justify conclusions.**<br>Describe and explain the purposes, relationship to randomization and differences among sample surveys, experiments and observational studies. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will describe the type of study, e.g., sample surveys, experiments, and observational studies, and why the type is selected.<br><br>The student will explain how randomization impacts each process, e.g., sample surveys, experiments, and observational studies. This would include the role of randomization. | | **Sample Stems**<br><br>A public health group wants to learn whether there are long-term effects on health and medical costs for teens who vape.<br><br>Explain the pros and cons for an experiment versus an observational study and decide which would be more appropriate in this situation.<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>No Limits. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 3 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

| Mathematics | | A2.DS.A.4 |
|---|---|---|
| **DS A 4** | **Data and Statistical Analysis** **PRIORITY STANDARD**<br>**Make inferences and justify conclusions.**<br>Use data from a sample to estimate characteristics of the population and recognize the meaning of the margin of error in these estimates. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will use data from a sample to consider (estimate) characteristics of the entire population while recognizing the impact of the margin of error in these estimates. | | **Sample Stems**<br><br>A school district conducted a survey of 100 randomly selected students, asking if they were getting the recommended 8 hours of sleep each night.<br><br>Their survey found that 54% of students responded yes, with a margin of error of 6%.<br><br>Would the school district be able to conclude that the majority of students get enough sleep? Why or why not?<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>Data samples should include margin of error. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 2 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

| Mathematics | | A2.DS.A.5 |
|---|---|---|
| **DS A 5** | **Data and Statistical Analysis**<br>**Make inferences and justify conclusions.**<br>Describe and explain how the relative sizes of a sample and the population affect the margin of error of predictions. | |
| **Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**<br><br>The student will describe and explain how the relative sizes of a sample and the population impacts (affects) both the margin of error and the accuracy of the prediction. | | **Sample Stems**<br><br>The cafeteria manager plans to offer more pizza choices and asks Jon and Murphy to find out which toppings students would like. The manager is surprised when Jon reports that 67% of students like mushrooms on pizza (4 out of 6 students surveyed), but Murphy says only 20% like mushrooms (10 out of 50 students surveyed).<br><br>Which survey has a larger margin of error, and how should that affect Mia's decision on how many mushroom pizzas to make?<br><br>Additional Stems for Algebra 2 Found at End of Document. |
| **State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**<br>Data samples should include margin of error. | | **Calculator Designation**<br>**YES** – a calculator will be available for items |
| **DOK Ceiling:** 2 | | |
| **Item Format:** Selected Response, Constructed Response, Technology Enhanced | | |

| Mathematics | | A2.DS.A.6 |
|---|---|---|
| **DS A 6** | **Data and Statistical Analysis**<br>**Make inferences and justify conclusions.**<br>Analyze decisions and strategies using probability concepts. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will use probability concepts to analyze decisions in various contexts, e.g. product testing, medical tests involving positive and negative results, a baseball pitcher's number of strikeouts. This includes analyzing the strategies (process used to make a decision).

For Algebra 2, probability concepts include conditional probability, independence and dependence, two-way tables, permutations, combinations, and rules of probability.

**Sample Stems**

A manufacturing company is considering two different methods to producing bolts for their machines before using them for assembly.

In the first method, the bolts are slowly produced and have a 1% chance to be defective. These bolts are installed immediately due to time constraints.

In the second method, the bolts are produced more rapidly and have a 5% chance to be defective. These bolts are then inspected by a machine. If the bolt is defective, the machine has a 95% chance to detect defective bolts. However, there is a 0.5% chance the machine discards a bolt with no defects.

Which manufacturing method should the company choose, and why?

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 3

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.DS.A.7 |
|---|---|---|
| **DS A 7** | **Data and Statistical Analysis**<br>**Make inferences and justify conclusions.**<br>Evaluate reports based on data. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will evaluate reports based on data, e.g., methodology of data collection, reasonable reporting of statistical analysis, and accurate graphical representations.

**Sample Stems**

A survey was conducted over the weekend to determine what sport was the students' favorite. They surveyed 135 students at the school's soccer tournament because of the large number of attendees. Here is the data where it was determined that Football was most popular followed by Soccer and Basketball.

| *Sport* | *Favorite Sport* | *Percent* |
|---|---|---|
| Football | 41 | 30.4% |
| Basketball | 20 | 14.8% |
| Baseball | 15 | 11.1% |
| Soccer | 25 | 18.5% |
| Volleyball | 16 | 11.9% |
| Wrestling | 10 | 7.4% |
| Tennis | 8 | 5.9% |
| Total | 135 | 100% |

Evaluate the reported favorites based on the data provided.

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limit.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 3

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.DS.B.8 |
|---|---|---|
| **DS B 8** | **Data and Statistical Analysis** **PRIORITY STANDARD**<br>**Fit a data set to a normal distribution.**<br>Know and use the characteristics of normally distributed data sets; predict what percentage of the data will be above or below a given value that is a multiple of standard deviations above or below the mean. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will use a given data set that is known to be normally distributed, use the empirical rule (68-95-99.7) to predict what percentage of the data will be above or below a given value that is a multiple of standard deviations above or below the mean, e.g., including between such as 1.5 standard deviations.

**Sample Stems**

Height for high school juniors and seniors is Normally distributed with a mean of about 68 inches, and a standard deviation of 3 inches. Using this information, explain why basketball teams at large high schools with 2000 students tend to have taller players than teams from smaller schools with fewer than 200 students.

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

No Limits.

**Calculator Designation**

**YES** – a calculator will be available for items

**DOK Ceiling:** 3

**Item Format:** Selected Response, Constructed Response, Technology Enhanced

| Mathematics | | A2.DS.B.9 |
|---|---|---|
| **DS** | **Data and Statistical Analysis** | |
| **B** | **Fit a data set to a normal distribution.** | |
| **9** | Fit a data set to a distribution using its mean and standard deviation to determine whether the data is approximately normally distributed. | |

**Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.**

The student will fit a data set to a distribution using its mean and standard deviation to determine whether the data is approximately normally distributed. Using the mean and standard deviation, students will determine that a data set is normally distributed if it contains approximately 68% of the data within one standard deviation of the mean, approximately 95% of the data within two standard deviations of the mean, and approximately 99.7% (all) of the data within three standard deviations of the mean.

**Sample Stems**

The table below shows the scores from the most recent test that Ms. Xiang's period 2 Algebra students took:

| | | | | |
|---|---|---|---|---|
| 79.6 | 83 | 85 | 80.2 | 77 |
| 82 | 81.2 | 75.6 | 88.7 | 86.6 |
| 79.2 | 79.6 | 87.8 | 87.3 | 79.9 |
| 80.5 | 80.4 | 85 | 77.7 | 76.3 |

Use the Empirical Rule to determine if the test data is approximately normally distributed

Additional Stems for Algebra 2 Found at End of Document.

**State Assessment Content Limits/Boundaries Classroom Work Should Include Extension**

Data sets should be no more than fifty numbers.

**Calculator Designation**

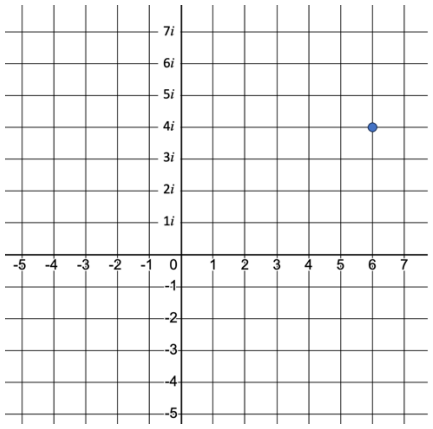
**YES** – a calculator will be available for items

**DOK Ceiling:** 2

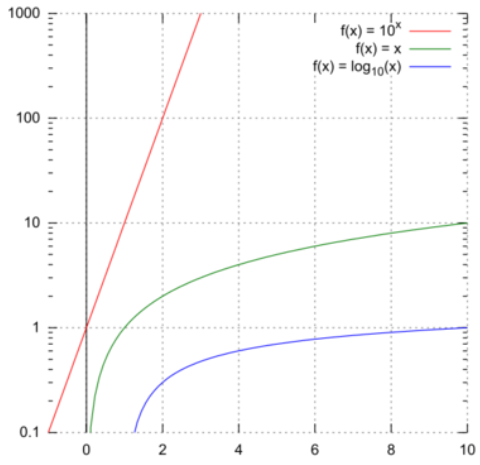
**Item Format:** Selected Response, Constructed Response, Technology Enhanced

<table>
<tr><th>Code</th><th>Sample Stem</th><th>Explanation</th></tr>
<tr><td>A2.NQ.A.1</td><td>Use the table below to look for patterns. Describe how those patterns help show the extension of the system of powers to include rational numbers.<br><br>
<table>
<tr><td>$\frac{1}{4}$</td><td>$\mathbf{2}^{?}$</td><td>$\mathbf{4}^{?}$</td><td>$\mathbf{8}^{?}$</td></tr>
<tr><td>$\frac{1}{2}$</td><td>$\mathbf{2}^{?}$</td><td>$\mathbf{4}^{?}$</td><td>$\mathbf{8}^{?}$</td></tr>
<tr><td>$\mathbf{1}$</td><td>$\mathbf{2^0}$</td><td>$\mathbf{4^0}$</td><td>$\mathbf{8^0}$</td></tr>
<tr><td>$\mathbf{2}$</td><td>$\mathbf{2^1}$</td><td>$\mathbf{4}^{?}$</td><td>$\mathbf{8}^{?}$</td></tr>
<tr><td>$\mathbf{4}$</td><td>$\mathbf{2^2}$</td><td>$\mathbf{4^1}$</td><td>$\mathbf{8}^{?}$</td></tr>
<tr><td>8</td><td>$2^3$</td><td>$\mathbf{4}^{?}$</td><td>$\mathbf{8^1}$</td></tr>
<tr><td>16</td><td>$2^4$</td><td>$\mathbf{4^2}$</td><td>$\mathbf{8}^{?}$</td></tr>
<tr><td>32</td><td>$\mathbf{2}^{?}$</td><td>$\mathbf{4}^{?}$</td><td>$\mathbf{8}^{?}$</td></tr>
<tr><td>64</td><td>$\mathbf{2}^{?}$</td><td>$\mathbf{4}^{?}$</td><td>$\mathbf{8}^{?}$</td></tr>
<tr><td>128</td><td>$\mathbf{2}^{?}$</td><td>$\mathbf{4}^{?}$</td><td>$\mathbf{8}^{?}$</td></tr>
</table>
<br>Be sure to indicate the values for each question mark exponent in the table.</td><td></td></tr>
<tr><td></td><td>Create equivalent expressions using other radical and exponential forms for each of the expressions below.<br>$\frac{81^{\frac{2}{3}}}{3}$ $\left(\frac{729}{64}\right)^{\frac{5}{6}}$ $\sqrt[3]{27x^5y^8}$</td><td></td></tr>
<tr><td></td><td>Find the sum of all solutions of x in the following problem:<br><br>$(x^2-5x+5)^{(x^2-9x+20)}=1$<br><br>Note: yes, $(x^2-9x+20)$ is an exponent.</td><td></td></tr>
<tr><td>A2.NQ.A.2</td><td>Jordan rewrote a radical expression using rational exponents as shown. Explain whether you agree with Jordan, if you disagree be sure to include the mistake in Jordan’s thinking, and give the correct rational equivalent.<br><br>$\sqrt[3]{x^2}=x^{3/2}$</td><td></td></tr>
<tr><td>A2.NQ.A.3</td><td>Divide the following expressions.<br><br>$x \div (x-\sqrt{2})$<br><br>Describe what it means to rationalize the denominator.</td><td></td></tr>
</table>

# High School Algebra 2

| Code | Sample Stem | Explanation |
|---|---|---|
| | Explain how the following expressions relate to $12\sqrt{2}$ be sure to include whether they are equivalent or how they are different.<br><br>$\sqrt{12}+\sqrt{12}$<br>$6\sqrt{2}+3\sqrt{8}$<br>$2\sqrt{6}\cdot 3\sqrt{3}$<br>$4\sqrt{2}\cdot 3\sqrt{2}$ | |
| | Find all the solutions where y equals 0 for the following equation.<br><br>$y=\frac{x^3+5x^2+3x-9}{x+3}$<br><br>Given the solutions, describe how each solution relates to the equation. | |
| A2.NQ.A.4 | Solve the equation $x=\sqrt{10-3x}$. Be sure to describe points of interest with the solutions. | |
| | Given the following complex number, 7 + 3*i*, describe what each part of the number represents. | |
| A2.NQ.B.5 | Given the complex plane that is shown, what is standard form for the number represented by the point.<br><br>  <br> | |
| A2.NQ.B.6 | Perform the indicated operations for the following problems involving complex numbers.<br><br>$(2+3i)+(4-3i)$ $(2+3i)-(4-3i)$<br><br>$(2+3i)\times(4-3i)$ $(2+3i)\div(4-3i)$<br><br>Use the work to support comments you would share with a classmate, if they missed the day complex numbers were discussed. What things should you pay attention to and watch out for as you solve these problems? | |

| | | |
|---|---|---|
| | What is the sum of $(3-7i)+(8+2i)$ written as a complex number in standard form? | Options include having other operations instead of addition. |
| Code | Sample Stem | Explanation |
| A2.NQ.B.7 | Theo and Al were studying the Fundamental Theorem of Algebra and were finding some questions. They were looking at two equations. One of them matched their understanding of the Theorem, but one did not. Identify which equation might have given them some reason to question the Theorem and explain what they may have done in error.<br><br>$y = x^3 + 6x^2 + 11x + 6$<br><br>$y = x^3 + 5x^2 + 8x + 4$ | |
| A2.SSE.A.1 | Use the properties of exponents to explain why the following logarithm property must be true.<br><br>$\log ab = \log a + \log b$ | The same question could be asked for all the logarithm properties, e.g.,<br>$\log 1 = 0$<br>$\log_a a = 1$<br>$\log \frac{a}{b} = \log a - \log b$<br>$\log a^m = m \log a$<br>$a^{\log_a x} = x$ |
| | Given $\log_3 81 = x$<br>Find the value of $x$. Be sure to use the definition of logarithms to support your answer. | |
| | Write $\log_x 30 = 2.4$ in exponential form. | |
| A2.SSE.A.2 | In class, Tommi has been studying how exponential and logarithmic equations are inverses. She finds the inverse of $y = 2^x$, but wants some suggestions on how to demonstrate that it is in fact the inverse. Find the inverse of Tommi's problem and show how to verify that the two equations are inverses. Your explanation should include graphs, coordinate values, or other mathematical strategies. | |
| | Jon solved the equation $3\log_2(2x+5) = 9$ with the following steps:<br>$\log_2(6x+15) = 9$<br>$6x + 15 = 81$<br>$6x = 66$<br>$x = 11$<br>Where did Jon go wrong, and what does is the correct solution? | |
| | Given the equation: $4^{n+7} + 3 = 80$<br><br>What is the value of $n$ to the nearest thousandth? | |

| Code | Sample Stem | Explanation |
|---|---|---|
| A2.SSE.A.3 | Jon is taking some antibiotics. Each dose contains 50 mg of antibiotics. After taking the initial dose, Jon is interested in how they decide the frequency of taking additional doses. His doctor shared the following equation, $D = 50(.82)^t$ where D is the Dose amount remaining in the body in mg and t is given in hours.<br><br>If the doctor wants at least 20 mg of medicine in Jon's system, how often should he retake the medicine? Explain your solution and be sure to include what the various components of the equation mean. | |
| | How can the following expression be written as a sum or difference of logs?<br><br>$\log_5 3a^2\left(\frac{1}{2}\right)b^5$ | |
| | Rewrite the following expression as a sum or difference of logs.<br>$\log_5 \frac{3a^2}{5b^4}$ | |
| A2.SSE.A.4 | The following graph shows a logarithmic scale. Describe each of the 3 functions represented. Be sure to include characteristics including the impact on the y values as x increases, the type of function represented, any domain and range observations, or other mathematical concepts observed.<br><br>  | |

Below is a table showing the Decibel (dB) level for several activities. After studying logarithms, you realize that graphing the Intensity of these activities might be better represented using a logarithmic scale. Select several activities listed from the chart and graph their intensity using a logarithmic scale.

One possible conversion formula to find the intensity is $dB = 10 \log\left(\frac{I}{I_0}\right)$, where *dB* are the activity's decibels, *I* is the intensity and $I_0$ is the initial intensity with $I_0 = 10^{-12}$.

| Decibels (dB) | Activity |
|---|---|
| 10 | Normal breathing |
| 20 | Leaves rustling, mosquito buzzing, or a ticking watch |
| 30 | Whisper |
| 40 | Quiet office or residential area, light rain |
| 50 | Moderate rainfall, refrigerator |
| 60 | Normal conversation, electric toothbrush, household washing machine, ringing telephone, or alarm clock |
| 70 | Washing machine, dishwasher, vacuum cleaner, or moderate freeway traffic |
| 80–85 | Gas-powered lawnmowers and leaf blowers, police car siren, or noisy restaurant |
| 90 | Baby crying, hairdryers, blenders, power tools, or shouting conversation |
| 100 | Approaching subway train, car horn at 16 feet (5 meters), hand dryers, or motorcycles |
| 110 | Shouting in the ear, nightclubs, or sporting events |
| 120 | Thunder, concerts, or a jet plane taking off |
| 130 | Jackhammers, ambulances |
| 140 | Fireworks, gunshot |

# High School Algebra 2

| Code | Sample Stem | Explanation |
|---|---|---|
| A2.REI.A.1 | Two Algebra 2 classmates are arguing about the solution to a problem. Stephanie and Matthew had both worked on the problem and felt their solution was correct. The problem asked students to find an equation for the sequence listed below. Compare each student's equation and discuss whether or not it fits the sequence listed. Remember that you can support your conclusions using words, tables, or graphs.<br><br>The sequence:<br><br>$\frac{2}{9}, \frac{4}{27}, \frac{8}{81}, \frac{16}{243}, \ldots$<br><br>Stephanie's solution: $t_n = \frac{2}{9} \times \left(\frac{2}{3}\right)^{(n-1)}$<br><br>Matthew's solution: $n_x = \frac{2^x}{3^{(x+1)}}$ | |
| A2.REI.A.2 | Solve the following rational equation. Be sure to support your solution using words, graphs, or other mathematical strategies.<br><br>$\frac{x}{x+2} - 4 = \frac{-2}{x-2}$ | |
| A2.REI.B.3 | Thom believes that system of equations having a quadratic and linear equation will have zero, one or two solutions. Using the system of equations below, find a value of *k* so there will be zero solutions, find a value of *k* so there will be one solution, and find a value of *k* so there will be two solutions.<br><br>$y = x^2 - 2x - 8$<br>$y = kx - 6$ | |
| | Harry is working with systems of equations and believes he has found a linear equation that will only have one solution in this system. Do you agree with Harry? Justify your answer using words, graphs, or other mathematical strategies.<br><br>$y = x^2 - 2x - 8$<br>$y = 3x - 6$ | |
| A2.APR.A.1 | Find and compare the three factors for each of the functions below.<br><br>$f(x) = x^3 - 2x^2 - 4x + 8$<br>$g(x) = x^3 - 2x^2 - 4x + 10$ | |

# High School Algebra 2

| Code | Sample Stem | Explanation |
|---|---|---|
| A2.APR.A.2 | Use the Remainder Theorem to compare the values of *f*(4) and *f*(5) from the function below. Be sure to explain both the similarities and differences.<br>$f(x) = x^3 + 3x^2 - 16x - 48$ | |
| | Use the Remainder Theorem to find the value of a, if *f*(4) = 28 and $f(x) = x^3 + ax^2 - 3x + 8$ | |
| A2.APR.A.3 | Find the least common multiple for the following polynomials.<br>$2x^2 + 16x + 30$<br>$x^2 - 2x - 15$ | |
| A2.APR.A.4 | Which operation, + - x or ÷, would create the largest solution for the following expression.<br>Explain your answer using mathematical work and reasoning.<br>$\frac{x^2 - 2x - 15}{7x + 21} \bigcirc \frac{x^2 - 3x - 70}{x^2 - 49}$ | |
| A2.APR.A.5 | Compare the following functions by identifying each function's zeros and then sketch each function. Describe observations about how the zeros are helpful in sketching functions, including situations to be aware of as the sketch is made.<br>$f(x) = x^4 + 2x^2 - 3$<br>$g(x) = x^3 - 2x^2 - 4x + 10$ | |
| A2.IF.A.1 | Identify and interpret the key characteristics of the function listed below. Be sure to include the following characteristics if they are applicable: domain, range, x- and y-intercepts; end behavior; local (relative) maxima or minima values; symmetries; specific values of the function; intervals where the function is increasing, decreasing or constant; points of discontinuity; and asymptotes. Also include how you used the graphing calculator or other graphing tool to support your answers.<br>$k(x) = x^4 - x^3 - 6x^2 + 4x + 8$ | Students should have access to graphing tools. |

| | | |
|---|---|---|
| | Identify and interpret the key characteristics of the function listed below. Be sure to include the following characteristics if they are applicable: domain, range, x- and y-intercepts; end behavior; local (relative) maxima or minima values; symmetries; specific values of the function; intervals where the function is increasing, decreasing or constant; points of discontinuity; and asymptotes. Also include how you used the graphing calculator or other graphing tool to support your answers.<br><br>$f(x) = \frac{x^2 - 4x - 21}{x^2 - x - 12}$ | |
| Code | Sample Stem | Explanation |
| A2.IF.A.2 | Given the function listed below, describe the equivalent form (vertex, standard, or intercept) that would best help one determine some of the key characteristics, e.g., x- and y-intercepts; end behavior; local (relative) maxima or minima values; symmetries; intervals where the function is increasing, decreasing or constant.<br><br>$f(x) = x^2 - 4x - 5$ | |
| A2.BF.A.1 | Create two new functions by first adding *f*(x) to *g*(x) then subtracting *f*(x) from *g*(x). Compare the new domain and range to the original functions for each new function.<br><br>$f(x) = x^2 + 4x - 21$<br>$g(x) = 2x^2 - x - 15$ | |
| | Create two new functions by first multiplying *f*(x) to *g*(x) then dividing *f*(x) by *g*(x). Compare the new domain and range to the original functions for each new function.<br><br>$f(x) = x^2 + 4x - 21$<br>$g(x) = 2x^2 - x - 15$ | Note: quadratics are not the only type of function students should have the opportunity to explore. |
| A2.BF.A.2 | Derive the inverse of the function shown below. Use algebraic or graphic support to verify the inverse of the function.<br><br>$g(x) = 2\log_4(x - 5)$ | |
| A2.BF.A.3 | Algebraically and geometrically describe the effect of doubling the length of a box (rectangular prism). Be sure to also include the impact on the volume and surface area of the box. | |

# High School Algebra 2

| Code | Sample Stem | Explanation |
|---|---|---|
| A2.FM.A.1 | Create a function that would maximize the surface area of two of the faces of a box. The volume of box should be approximately 216 cubic inches and the width of the base should be at least 2 inches. Show how the function helps determine the maximum surface area for the two faces. | |
| A2.DS.A.1 | Austin is conducting a study to determine which school sport the students at his high school are most likely to attend.<br><br>Austin plans to conduct his survey at an upcoming baseball game by polling students as they wait in line to buy tickets to the game. Would this survey be representative of the population as a whole? Why or why not?<br><br>How could Austin adjust his survey to better represent the population he is interested in? | This task is best done through a conversation, with students explaining the flaws and better models in conducting a survey. |
| A2.DS.A.2 | Your math class is using the following algebraic function to model rolling a fair six-sided die, with numbers 1 to 6. The model could be used to predict the number of times the die will land on an even number.<br><br>$r(x) = .5x$, where x is the number of rolls made in the experiment and r(x) would be the number of times the die lands on an even number.<br><br>The class rolls the die 20 times and gets the following result:<br><br>4, 2, 3, 3, 6, 6, 2, 3, 5, 2, 4, 5, 2, 3, 3, 6, 1, 4, 6, 2<br><br>Explain whether or not this model is consistent with the given data set. | |

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|---|---|---|
| | For the following situation, identify the population and the sample.<br><br>A school board wants to know how voters feel about a new football stadium at the high school. They conduct a survey of 200 people attending a home football game, asking if a new stadium should be built.<br><br>Explain whether the sample represents the population.<br><br>Of those who take the survey, 70% are in favor of building a new stadium. If the school board could ask ALL voters, do you think the results would be higher, lower, or about the same as the 70% from the survey? Explain your answer.<br><br>What other ways could you conduct the survey to give the school board good data on how voters feel about a new stadium? | |
| Code | Sample Stem | Explanation |
| A2.DS.A.3 | A public health group wants to learn whether there are long-term effects on health and medical costs for teens who vape.<br><br>Explain the pros and cons for an experiment versus an observational study and decide which would be more appropriate in this situation. | |
| | For the situation below, explain whether you would conduct a survey, observational study, or experiment, and why:<br><br>Determine whether consuming caffeine before a track event impacts an athlete's performance.<br><br>Explain how you would use randomization to design the study, and the importance that randomization carries for each study. | Some other possible situations:<br><br>• Whether people who consume large amounts of red meat develop heart disease.<br><br>• What is the preferred source of news for residents of Jefferson City, Missouri. (or some other city). |
| A2.DS.A.4 | A school district conducted a survey of 100 randomly selected students, asking if they were getting the recommended 8 hours of sleep each night.<br><br>Their survey found that 54% of students responded yes, with a margin of error of 6%.<br><br>Would the school district be able to conclude that the majority of students get enough sleep? Why or why not? | |

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| | In 1990, 80% of Missouri high school seniors had a driver's license. In 2022, a random survey of 1000 Missouri seniors found that 76% had a driver's license. The survey reported a margin of error of 5%.<br><br>Explain if it is fair to say that the proportion of high school seniors with driver's licenses has dropped since 1990? | |
| Code | Sample Stem | Explanation |
| | The cafeteria manager plans to offer more pizza choices and asks Jon and Murphy to find out which toppings students would like. The manager is surprised when Jon reports that 67% of students like mushrooms on pizza (4 out of 6 students surveyed), but Murphy says only 20% like mushrooms (10 out of 50 students surveyed).<br><br>Which survey has a larger margin of error, and how should that affect Mia's decision on how many mushroom pizzas to make? | |
| A2.DS.A.5 | Popular bite-sized candies often come in a variety of colors and can be bought in different sized packages. For each of the following sized packages, find the proportion of red candies, then provide an estimate of the proportion of red candies the company produces, including a margin of error:<br><br>•Fun size (approximately 13 grams)<br>•Standard size (1.69 ounces/47.9 grams)<br>•Family size (18 ounces)<br><br>How does the size of the bag affect the certainty of your estimate? | |
| A2.DS.A.6 | A manufacturing company is considering two different methods to producing bolts for their machines before using them for assembly.<br><br>In the first method, the bolts are slowly produced and have a 1% chance to be defective. These bolts are installed immediately due to time constraints.<br><br>In the second method, the bolts are produced more rapidly and have a 5% chance to be defective. These bolts are then inspected by a machine. If the bolt is defective, the machine has a 95% chance to detect defective bolts. However, there is a 0.5% chance the machine discards a bolt with no defects.<br><br>Which manufacturing method should the company choose, and why? | |

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|---|---|---|
| | A Carnival two games where you roll a pair of dice to win money as shown below. You have $10 to spend. Would you rather play "Double Your Money!" five times, or play "Double Double!" twice? Give reasons to support your choice.<br><br>Choose Your Price & Roll the Dice!<br>Game A: Double Your Money! You pay $2<br>Roll 2 even numbers and Double your Money! — You WIN $4<br>Roll 1 even number — $1<br>No even numbers — 50¢<br>Game B: Double Double! You pay $5<br>Roll... — You WIN<br>2 even numbers and Double your Money! — $10<br>Roll 1 even number — $1<br>No even numbers — 50¢<br>Roll Double Evens & get Double Double! $20 | |
| Code | Sample Stem | Explanation |
| A2.DS.A.7 | A survey was conducted over the weekend to determine what sport was the students' favorite. They surveyed 135 students at the school's soccer tournament because of the large number of attendees. Here is the data where it was determined that Football was most popular followed by Soccer and Basketball.<br><br>*Sport* / *Favorite Sport* / *Percent*<br>Football 41 30.4%<br>Basketball 20 14.8%<br>Baseball 15 11.1%<br>Soccer 25 18.5%<br>Volleyball 16 11.9%<br>Wrestling 10 7.4%<br>Tennis 8 5.9%<br>Total 135 100%<br><br>Evaluate the reported favorites based on the data provided. | |
| A2.DS.B.8 | Height for high school juniors and seniors is Normally distributed with a mean of about 68 inches, and a standard deviation of 3 inches. Using this information, explain why basketball teams at large high schools with 2000 students tend to have taller players than teams from smaller schools with fewer than 200 students.<br><br>A group of students took an Algebra 1 end-of-unit test. The score was approximately normally distributed with a mean score of 72.9% and a standard deviation of 7.1%.<br><br>What percent of students scored a B (80%) or higher? | |

<table>
<tr><td></td><td>What percent of students passed the test (scored at least 60%)?<br><br>Mathematically support your answers using equations or words.</td><td></td></tr>
<tr><td>Code</td><td>Sample Stem</td><td>Explanation</td></tr>
<tr><td rowspan="2">A2.DS.B.9</td><td>The table below shows the scores from the most recent test that Ms. Xiang’s period 2 Algebra students took:<br><br><table><tr><td>79.6</td><td>83</td><td>85</td><td>80.2</td><td>77</td></tr><tr><td>82</td><td>81.2</td><td>75.6</td><td>88.7</td><td>86.6</td></tr><tr><td>79.2</td><td>79.6</td><td>87.8</td><td>87.3</td><td>79.9</td></tr><tr><td>80.5</td><td>80.4</td><td>85</td><td>77.7</td><td>76.3</td></tr></table><br>Use the Empirical Rule to determine if the test data is approximately normally distributed.</td><td></td></tr>
<tr><td>The table shows heights for 42 sophomores. The mean height is 64.5 inches, with a standard deviation of 2.7 inches. Does height appear to be Normally distributed for these students? Justify your answer.<br><br><table><tr><td>58</td><td>59</td><td>61</td><td>61</td><td>61</td><td>62</td></tr><tr><td>62</td><td>62</td><td>62</td><td>63</td><td>63</td><td>63</td></tr><tr><td>63</td><td>63</td><td>64</td><td>64</td><td>64</td><td>64</td></tr><tr><td>64</td><td>64</td><td>64</td><td>65</td><td>65</td><td>65</td></tr><tr><td>65</td><td>65</td><td>65</td><td>65</td><td>66</td><td>66</td></tr><tr><td>66</td><td>67</td><td>67</td><td>67</td><td>67</td><td>67</td></tr><tr><td>68</td><td>68</td><td>68</td><td>68</td><td>69</td><td>71</td></tr></table></td><td></td></tr>
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